ART. VI.—METALLOSCOPY AND METALLOTHERAPY.

BY H. GRADLE, CHICAGO.

DURING the last two years French medical periodicals have published a series of notes on the above subjects, of which each succeeding article surpassed its predecessor in the marvelousness of its results. Naturally enough the articles were received everywhere with avowed scepticism; the reputation, however, of the writers, as well as the agreement in results of different independent observers, must invite a conscientious study of the subject.

M. Burq, the inventor of the procedure, has maintained his ideas on this subject for some twenty-five years, but, with the exception of Trousseau, no one seems to have paid any attention to it until Professor Charcot invited Burq to experiment in his wards. Subsequently the Society of Biology, of Paris, appointed a commission, consisting of MM. Charcot, Luys and Dumontpallier to investigate the subject. Their various reports can be found in the proceedings of that society of 1877 and 1878. According to a citation of Charcot an instance of true metallotherapy is found in an old work by Wichmann, "Ideen zur Diagnostik," published in 1778. Repeated a few times by others, it was still never practiced methodically, and was gradually forgotten. M. Burq has, hence, the undoubted merit of creating the method of external applications of metals for diagnostic and therapeutic purposes.

The disease in which most experiments have been made is hysteria, of which a number of cases had the graver form of hystero-epilepsy. The typical case, always female, figuring in most descriptions, is about the following: Anæsthesia, more or less complete in degree and extent of one side of the body, impairment or inactivity of the organs of special sense of that side, and relative muscular weakness of the same side—amyosthenia of the French—besides usually tenderness of the corresponding ovary. But a disease as variable in its manifestations as hysteria, creates of course numerous complications, such as hyperæsthesia, contractures, etc., to be found in some of the cases. The procedure of metalloscopy consists in removing or altering these symptoms by contact of the skin with some metal. Each patient is said to be sensitive to *only one* metal, rarely more, and to no others, and hence the first step must be to discover the idiosyncrasy of the patient. M. Burq gives the following list as the scale of frequency of influence of the different metals: iron, copper, zinc, gold, silver, tin, rarely platinum, and probably arsenic and antimony. Metallic discs of the size of large coins, or wooden discs coated with the metal, are employed, being arranged in the form of a bracelet around the member, or simply held in place by a bandage. Within one to fifteen minutes objective changes can be seen. The anæsthetic skin, formerly cold, pale, and almost bloodless when pricked, now becomes reddened, warmer, and even hyperæmic; the patient complains of numbness of that spot, and the sensibility begins to return. There is at first a stage of inaccurate sensibility when warmth is taken for cold, and *vice versa*, but soon the normal state is reached. The patient, formerly insensible to deep pricks, will now shun a mere touch of the pin. At the same time the special senses return to their normal activity, and the dynamometer indicates now a full strength of the formerly enfeebled muscles. Where a contracture existed it usually disappears. But on the other, formerly normal, side of the body a peculiar change can now be found. Exactly what one side has gained, the other side has lost. When the anæsthesia disappears only in the vicinity of the metallic disc, the symmetrical spot on the previously normal side of the body loses its sensibility to the same extent, while in those cases in which the metallic application removes the *existing* anæsthesia completely there still remains a hemianæsthesia, it being only transferred to the other side. What one ear, nostril, or half of the organ of taste gains, the other loses in perception. Even the one-sided increase in muscular strength is obtained at the expense of the other side of the body. In short, the patient has gained nothing, there has only been a "transfer" of sensibility.

The original anæsthesia disappears at first at the point of metallic contact, subsequently in the vicinity, to the extent of some 6 or 8 centimetres. If the discs are now removed, the return of sensibility continues, and, finally, the original anæsthesia disappears completely. At the same time the *loss of sensibility* of the other side follows the identical course. The phenomena last some hours, rarely longer than one day in any hysterical case, when everything returns to its former condition. If, however, the metal *is left in place* continuously, an entire change in the course is observed within a short time. The returned sensibility, instead of continuing to spread, suddenly disappears again, a corresponding change taking place also on the other side. Both sides have returned to their original condition, while the metal is still applied. In fact, the anæsthesia and amyosthenia may be even more complete than they were originally. This state M. Burq calls the return anæsthesia.

The return anæsthesia is called by Charcot a test for the hysterical diathesis. If in a hysterical patient all manifestations of the disease have disappeared in the course of some treatment, the application of the metal, to which she was sensitive previously, causes no change whatever in the case of a perfect cure. If, however, the hysterical diathesis still exists, though latent, the metalloscopic application gives rise to a feeling of numbness, malaise and drowsiness, often causing sleep, while the sensibility disappears completely at the place of application.

It had been known to Burq for some time, that a metal to which a patient had previously been found sensitive seemed to lose its influence completely when covered with another disc of a different metal, which was known to possess by itself *no* influence over that patient. On investigating this question further, Dr. R. Vigouroux found, moreover, that the addition of a second *indifferent* metal prevented any further change of the condition existing at the time of application of the second metal. Thus, a patient found sensitive to the influence of gold, but not to copper, could have his sensibility restored (of course at the expense of the other side) by an application of some gold coins; if now an equal number of copper discs were placed either on the gold or simply on the adjoining skin, the *statu quo* could be preserved for an indefinite time. But, if the copper was not applied until the return anæsthesia had set in, that state now became the permanent condition as long as the metals were left in place.

External metallotherapy consists in the repeated application of the active metal. No one, however, claims any actual experience in this except M. Burq. According to him a succession of metalloscopic attempts, continued every time until the return anæsthesia sets in, ameliorates the hysterical symptoms gradually, and a cure can be obtained in the space of some months. Lately, however, Burq has himself abandoned this method for internal metallotherapy.

Statements like these, which seem at first to baffle completely all attempts at explanation should be received with caution. But the question : " Are they facts?" must be answered affirmatively. The reputation of the French observers suffices to remove all suspicions. The experiments have besides been verified by others, for instance, by Westphal* and by Maragliano and Seppilli (*Rivista Sperimentale di Freniatria*, etc., 1878, fasc. I., p. 36). Scepticism is awakened in the minds of many when the word hysteria is mentioned. No doubt many hysterical patients do lie and simulate to their heart's content, but still no one is *a priori* justified in calling everything deception, when an impartial, careful observer describes what he has observed in hysterical patients. Numerous foreign physicians (the writer himself amongst them) had followed the researches in Charcot's wards, and found them as certain as physical experiments. Perhaps one of the best guards against deception on the part of the patients is the agreement of results in hysterical amblyopia, the details of which the patients could not possibly know beforehand.

The extreme periphery of the healthy retina cannot perceive all colors with ordinary illumination. The field of vision, larger for the perception of light in general, than for any one color, is not the same for the different colors. Violet can be perceived by only the more central parts of the retina, green has a larger field of vision, next in order are red, orange and

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**Berl. klin. Wochenschrift*, No. 30, 1878. Unfortunately the original was not at hand.

yellow, while blue is still perceived by the most peripheral zone. In an ideal schema we can conceive the retina to consist of a series of superimposed layers, each for the perception of a different color, of which the *blue* layer is the largest, and the violet the smallest.

This normal condition is exaggerated in hysterical amblyopia. Besides the reduced visual acuity we find in this trouble a characteristic limitation of thé field of vision, for light in general, and still more so for colors. Referring to the ideal schema, it might be said, that the difference between the extent of the different color-perceiving layers is increased. Hence all degrees may be found, from a mere limitation of the visual field, to the absence of one or more central colors, as violet, green, etc., or even the entire absence of all color-perception. In the latter case all nature appears to the patient like a crayon-drawing. On applying a disc of active metal to the temple of such a patient, the observer can follow step by step the increase in visual acuity, and the gradual peripheral extension of the color-perceiving zones. If all perception ot colors had been lost, the colors re-appear in the order of their peripheral extension; blue can be recognized first, violet last. On keeping the metal in place the return anæsthesia can be studied with equal ease Violet disappears first, blue last, and the amblyopia is sometimes more intense than before the experiment, returning, however, to its former condition on removal of the metal. If the metal is removed before the return anæsthesia sets in, the visual improvement lasts for some hours. The positiveness and unanimity with which different, unsophisticated patients pronounce upon the order of appearance and disappearance of the colors bears very little resemblance to deception. A unilateral application of the active metal removes the amblyopia at the expense of the other eye, *i. e.*, simple transfer of sensibility. Cases have, however, been reported, in which no transfer occurred, a bilateral or median application improving simultaneously the visual power of both eyes.

Not alone in hysteria, but also in organic troubles is metalloscopy applicable. Strange to say, there was no transfer of sensibility in these cases, the normal side remaining unaltered, and the effects were permanent. In a recent lecture (*Gaz. des Hop.*, March 14, 1878) Charcot refers to two cases of hemianæsthesia in consequence of cerebral hemorrhage, one a girl of twenty-four years afflicted since youth, the other an old woman of fifty-four years in that condition for twelve years, both without hysterical taint. A single application of iron in one case, of gold in the other, restored both special and ordinary sensibility at once, without transfer, and this result has remained so for the last fifteen months. Charcot's explanation is, that not all fibres of the internal capsule were involved in the destructive process, but that a number remained healthy, but inactive, dormant so to speak; the integrity of the latter would account for the restored sensibility. Another case of hemianæsthesia and hemichorea after apoplexy (perhaps the same one?) was reported by Landolt and Oulmont (*Progrès Méd.*, May 19, 1877), in which the sensibility was completely restored, and the hemichorea ameliorated by a single application of gold. In spinal affections, however, Charcot has never seen any success whatever from metalloscopic attempts. He admits also to have met with some hysterical patients in whom metalloscopy did not succeed.

In order to examine the role of electricity in these phenomena, M. Regnard investigated this matter at the demand of the commission with a delicate galvanometer. He found that the contact of any metal with the dry skin gave rise to an electric current, the strength of which could be determined by the deviation of the needle of the galvanometer. This current is due to the contact; it depends on the difference in electric tension on the principle of the dry voltaic pile, and not necessarily on any chemical action. Eulenburg* has, however, pointed out an error of Regnard's, in using polarizable electrodes, and hence obtaining exaggerated needle-deviations. He, himself, employed the unpolarizable electrode of DuBois-Reymond (glass tubes, closed at the end with a plug of clay, moistened with a 1 per cent. solution of common salt, and filled with a saturated solution of sulphate of zinc, into which are dipped zinc rods connected with the wires of the galvanometer). With these means he obtained smaller deviations of the needle, but confirmed the statement that a current is generated by contact of the skin with metallic discs, that the strength and direction of this current vary according to the metal employed, but are not the same with the same metal in all subjects. This variance between different individuals, Eulenburg refers to differences in the chemical nature of the cutaneous secretion, which is apt to be exaggerated in nervous affections. By placing between the metal and skin a piece of dry paper, the current was stopped; by employing a paper saturated with a solution of salt, the current was intensified. Chemically pure gold and platinum were found almost inactive by Eulenburg and by Regnard, and are also said to possess little if any therapeutic action.

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* *Deutsche med. Wochenschrift*, July 22, 1878.

Regnard,* moreover, found that all metalloscopic effects could be produced by employing a feeble galvanic current, yielding the same deviation of the galvanometer as the contact of the metal to which that patient was sensitive.

However, from his detailed description it appears that success is not closely limited to currents of *exactly* the same needle-deviation as that of the active metal, but that the limits are quite extended. Besides, the same deviation of the galvanometer does not by any means imply identity of any two currents in both quantity and tension. A patient, for instance, whose sensibility was restored by a current of 2° needle-deviation, was not affected by a current of 15°, while 40° and more again produced the desired effect. Another was affected by 15°, not by 40°, but again by 80°. A third was sensitive to 40° and to 90°, while a medium current of 70° remained inactive. There are hence in every case certain varying limits of intensity within which a current restores sensibility; between the extreme limits, however, there exist "neutral points" at which the current loses its influence.

But these researches, interesting as they are, are far from furnishing a satisfactory explanation of metalloscopy. No one can suppose that these feeble currents are diffused to the extent of the returned sensibility, either superficially, when the returning sensibility spreads from the point of application over the entire side, or toward the interior, when the optic or auditory nerves resume their functions after application of a coin to the temple. Besides we can employ other means for the same purpose. It has been known since Duchenne's time, that hemianæsthesia, dynamic or organic, can sometimes be removed by a single faradization. Numerous cases are also reported of similar effects produced (especially in hysteria) by the action of magnets at a distance.*

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* Societé de Biologie, Seance du Fev. 3 and 17, 1877.

By charging the patient seated upon an insulated chair with static electricity, the return of muscular strength, of color perception and of sensibility throughout, can also be effected, but these functions disappear again on interrupting the electrization.

M. Thermes† has even succeeded in obtaining all usual metalloscopic phenomena (including the transfer of sensibility) by the application of a piece of ice in a case of hysteria, while Westphal (loc. cit.) claims to have had an equal success with varnished or even non-metallic discs and sinapisms.

The most satisfactory explanation, as far as it goes, has been given by Vigouroux (*Gaz. des Hopitaux*, Nov. 17, 1877). He starts from the fact, that a metal known to be active in a certain case loses its influence apparently by being covered with another indifferent metal. In any voltaic pile the difference between the electric tension of the first and of the last metal does not depend on the intervening metals. If the first and the last are the same, there is no difference in tension. In the case of a patient sensitive to gold but not to copper, there is but little difference in electric tension between the skin and the copper disc, and this is not increased when the two are separated by a disc of gold. But if the copper is again covered with a second disc of gold, so as to make the order—skin, gold, copper, gold—we have the full difference in tension between skin and gold, and also the physiological effect. In the case of feeble galvanic currents, two things are to be considered, viz.: the passage of the currrent and the tension of the electrodes due to their polarization. Vigouroux claims that only the latter circumstance is of influence, since by using *unpolarizable* electrodes, he could obtain no metalloscopic effects from currents perfectly active with ordinary electrodes. On the other hand he has seen the usual results produced by unipolar action, *i. e.*, by the application of only one metallic electrode, when of course no current could pass. As further proof of his views, he cites the effect of platinum, which ordinarily is inactive, but which obtains metalloscopic properties by polarization, after having been included in a feeble galvanic circuit. In short, Dr. Vigouroux claims that the essential condition of metalloscopic phenomena is a variation, of varying degree and duration according to the subject, of the electric tension of some point of the organism. (*Gaz. des Hop.*, Aug. 24, 1878.)

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* *Vide* Maragliano and Seppilli, loc. cit. R. Vigouroux, *Gaz. des Hop.*, May 21, 1878, and *Progrès Méd.*, No. 35, et seq., 1878. Charcot in Societé de Biologie.

†*La France Méd.*, No. 71, 1878.

As far as this explanation goes, it seems in accordance with the facts. There is still much left to be explained, but attempts must be made in the laboratory, and not at the writing-desk.

While the above statements would tax our credulity severely if not supported by men of their reputation, the claims which M. Burq makes for internal metallotherapy are even more marvelous. That metal which previous metalloscopic attempts have shown to possess an influence when applied externally, is given to the patient internally in ordinary form and dose, with the result, Burq claims, of a perfect cure of hysterical symptoms and diathesis. As a test for the complete cure he re-applies the metallic disc; if no return anæsthesia follows the disease is eradicated. Charcot, while occupying a perfectly neutral stand-point, gives Burq the credit of having ameliorated the condition of four cases of hystero-epilepsy, all of which he had known for years as unmanageable by any treatment. Burq assumed the charge in July, 1877, and in October one of the cases influenced by copper had been completely cured by its internal administration; the other three, all treated with gold, had been free for some time of all hysterical manifestations, and had gained immensely in general health; they were, however, still subject to the return anæsthesia on external application of gold coins. Another case of long-standing hysteria completely cured by Burq by the internal use of silver, according to metalloscopic indications, is reported by V. Revillout (*Gaz. des Hop.*, July 27, 1878); several others are now being published.

Results like these, vouched for by responsible parties, render further investigation a duty. All attempts of explanation, however, are at present but speculative.